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EXECUTIVE SUMMARY & INDUSTRY OVERVIEW
NUEXCO REPORT 158

The **Exchange Value** remained at $23.50 per pound U_3O_8, unchanged from the previous two months. Near term supply and demand remained at about the same level as last month. About 7.5 million pounds U_3O_8 is currently being offered for sale in the near term market. Demand in the same time frame is about four million pounds. The near term supply-demand ratio of two-to-one is the strongest the market has seen in some time. Prior to this month, the 1981 average was nine-to-one. Most sellers are now reluctant to offer material significantly below Exchange Value.

The **Transaction Value** decreased slightly to $23.90 per pound U_3O_8, from $24.30 the previous month. Five transactions were concluded this month. Two were long term sales, one by a Canadian producer, the other by an Australian producer. Three near term sales are reported, all by US sellers. The prices of the near term sales are all close to Exchange Value.

The **Conversion Value** remained at $1.10 per pound U as UF_6. One near term transaction closed this month somewhat below Conversion Value. There are several near term sellers in the secondary market for conversion services, but there are no buyers at this time.

Canadian producers have been active in the US market in recent months. Several long term contracts have either already been signed or are in the final stages of negotiation with US purchasers. All Canadian contracts are subject to approval by the Canadian government review panel.

This month's Report contains a revised forecast of free world uranium production, including an estimate of 1981 world production. It appears that production in 1981 will be about the same as 1980, approximately 111 million pounds U_3O_8. US production is expected to be about 37 million pounds this year, down from 42.5 million last year. The decrease in the US will be about compensated by increases in Canada and Australia.

The *Topical Essay* this month continues the series on unconventional transactions, with the focus on Bridge Transactions. This month's *Raw Materials* essay contains the first part of a discussion on the Key Lake deposit.

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INFLUENCE OF FOREIGN URANIUM ON THE UNITED STATES MARKET

By

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"WHAT HAPPENED TO THE URANIUM BOOM?"

By

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PRESENTED AT:

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INFLUENCE OF FOREIGN URANIUM ON THE UNITED STATES MARKET

by T.A. Boyden

The Free World uranium market is now characterized by production nearly twice that of consumption resulting in a rapid build-up of uranium inventories. Low-cost production from high-grade deposits in Australia and Western Canada will gradually add another ten to 15 million pounds U_3O_8 annually into Free World production throughout the 1980's. This latter material cannot be absorbed in further inventory build-up and can only displace higher cost production. The result is a restructuring of the Free World producer industry.

As United States production declines, US utilities must increase their reliance on foreign supplies in order to meet their needs. This paper reviews the elements that will cause the restructuring of the Free World producer industry and the expected response of the US utility industry to that developing situation.

Introduction

Ten years ago, the US had a dominant position in the uranium market, holding 25 to 30 percent of the Free World reasonably assured reserves and 35 to 40 percent of Free World production. Other major production centers were limited to Eastern Canada and Africa. US production rose continuously from 28 million pounds U_3O_8 in 1971 to 42 million pounds in 1980. Large new discoveries in Australia and Western Canada had no significant impact on the market in those years due to the long time required to develop the deposits.

Beginning in 1979, the market reacted to a series of events which had been building over several years. As of year end 1980, Free World production of more than 110 million pounds U_3O_8 was more than twice Free World consumption of 40 million pounds U_3O_8, and inventory levels were accumulating rapidly. Previous market perceptions of a uranium shortage were quickly changing to the realization of uranium over-abundance. Western Canadian production was being offered in world markets, and plans were developing quickly for bringing the Ranger deposit in Australia into production. US production peaked in 1980 and there are no signs that this production level will be attained again.

Foreign Uranium Availability

Uranium resources throughout the Free World increased four-fold from 1967 through 1979. According to Nuexco's latest estimate of reasonably assured resources at a forward cost of $25.00 or less per pound U_3O_8, approximately 86 percent of world resources available in the commercial market are located in Australia, Canada, South Africa and the United States. Of the four countries, only the US is a major producer and major consumer of U_3O_8. Thus, producers in the other three countries must export in order to market their material.

Reasonably assured resources for the four countries are tabulated according to Nuexco's latest estimate in Table 1.

Table 1

SUMMARY OF URANIUM RESOURCES REASONABLY ASSURED AT FORWARD COST BELOW $25 PER POUND U_3O_8

Country	Tons U_3O_8
Australia	457,000
Canada	297,000
South Africa	266,000
United States	349,000
Total	1,369,000

Most new production in Australia and Canada is in the form of large, high-grade deposits, most of which can be mined using low-cost open-pit methods. In South Africa, approximately 89 percent of the uranium resources occur in association with gold mineralization in the Witwaterstand quartz-pebble conglomerates. Uranium production has a low-cost allocation as a

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by-product to the production of gold. By comparison, the resources of the US are low grade, unusually deep, and are recoverable at or below $25.00 forward cost only where mine-mill facilities are now in place. Most undeveloped deposits in the US are not considered to be available at the $25.00 or less forward cost level.

Non-US Production Potential

A near doubling of production in Australia and Western Canada is forecast for the 1980's. As a consequence of production economics, high cost production in the US gradually will be curtailed. US production is expected to decrease from 37 million pounds U_3O_8 in 1981 to 14 million pounds in 1990 despite growing US consumption. Production from Australia and Canada will steadily displace US production. In this transition period, Free World production will continue to exceed consumption, resulting in increased inventory accumulation. This in turn will create additional downward pressure on uranium prices.

The above market description pits the United States and Eastern Canada against Australia and Western Canada in the Free World competition. South Africa will continue to produce at a near-constant rate with costs sufficiently low to hold a base market position. In other nations, producers are considered to be captive to their own national interests or bound by long-term contracts. For example, production from deposits in France, Niger, Gabon and Namibia is committed well into the future with existing contracts. It is doubtful whether much of this material will soon become available for competitive marketing.

The important new production of the Free World will come from high-grade deposits of Australia and Western Canada. Since consumption and inventory accumulation cannot absorb this new production, other Free World production--mainly in the US—must be displaced. A low market price will probably be the displacement mechanism.

A summary of the previously announced major projects in Australia and Canada are listed in Table 2. In addition, there are a number of smaller and lower grade deposits in both countries, some of which may begin production during the same period.

Table 2

NEW PRODUCTION CENTERS IN AUSTRALIA AND WESTERN CANADA WHICH MAY START UP IN THE 1980'S

Country/Project	Probable Production Level (Millions of Pounds U_3O_8/Year)	Estimated Project Life (Years)
Australia		
Ranger	6.6	40+
Koongarra	2.4	11+
Jabiluka	6.6	30+
Yeelirrie	6.0	22
Olympic Dam	9.0[1]	50+
Canada[2]		
Key Lake	8.0+	20+
Midwest Lake	4.0	14

[1]Uranium produced as a co-product of copper.

[2]In addition, the Collins Bay mine will start up during this time period, but the ore will go through the existing Rabbit Lake production center.

Each of the deposits listed in Table 2 will likely be brought into production at costs below US $20 per pound (in constant 1981 dollars). It is readily apparent that the Australians and Canadians have the capability to assume cost leadership in the market as these new projects come into production.

The production of by-product uranium in South Africa will continue to supply an important segment of the market. Uranium is produced currently as a by-product from ten mines and as a co-product from five mines in South Africa. The current rate of production is about 18 million pounds U_3O_8 annually. South African producers have established their position in the uranium market and are in a favorable situation to compete with the Australians and Canadians for future sales.

The contraction of US production has already begun. As long-term delivery contracts are fulfilled, producers will cutback on production and eventually close mines and mills because operations will not be competitive in existing spot or long term markets. The contraction of production will continue into 1990 when US production levels will have decreased about 60 to 70 percent below 1980 production.

The world uranium market price will probably remain below the price required for profitable operations by most US producers for several years. Only a few US producers can compete in the present market price range of $23.50 per pound U_3O_8. The exception will be the case where the utility purchaser has a "buy US" bias.

Market Impact

A paradox is developing within the US producer consumer industry. The producer industry is facing substantial curtailment of production during the period in which Nuexco projects US consumption requirements will increase to 40 million pounds by 1990.

The critical question is whether US utilities will purchase large quantities of non-domestic material to meet their future needs. Nuexco judges that over the next ten to 15 years, utility purchasing agents will gradually increase their willingness to purchase foreign uranium. Some utilities which previously intended to limit foreign supplies to between 25 and 35 percent of requirements now talk about increasing their limits to perhaps 50 percent of requirements. The transition will be slow and will develop as US utilities gain confidence in the reliability of non-domestic producers. The US utilities as an alternative can pay a substantial premium to maintain United States producers, thus creating a two-tier market.

There are US producers that suggest a second uranium embargo is needed to protect the US production industry. At the same time, there are non-US producers and potential producers expressing concern about the embargo possibility. Such an embargo would likely establish the two-tier market and force utilities to purchase higher price material. Nuexco does not anticipate an extension of the embargo. There is little economic justification for an embargo and there are potential political ramifications associated with such an act upon the major US trading partners, Australia and Canada.

US utilities will continue to search out US producers which can supply material at or near market price. These producers must seek ways to remain cost competitive. In-situ production, by-product production and discovery of shallow high-grade ore bodies are the principal routes to success. An improved social, financial and, perhaps most importantly, political environment, are essential elements to this end.

"WHAT HAPPENED TO THE URANIUM BOOM?"

by M.J. Reaves

The title of my talk, "What happened to the Uranium Boom?" is old news. Certainly it is for this group. All of us that make our living in uranium know that the boom of the last half of the 1970's is over. US production has been exceeding consumption by more than two to one. Mines and mills are closing and yellowcake prices have been dropping for over 29 months. The gloomy outlook for the industry in the near term has been well documented by observers of various descriptions, your daily newspapers, and in the Nuexco Monthly Reports.

I'd like to attempt to describe the next upturn in the market (speculate, really) based upon the clues we are seeing now. In order to do that, I would first like to go over briefly some of the market factors that contributed to the recent price drop and resultant production cutbacks, and then hypothesize on the way these factors are changing and will change.

Market prices are greatly affected by buyer perceptions. This is particularly true with uranium, because of the long lead times associated with nuclear plant construction and also with conventional mine mill development.

Before the price rise, utility uranium buyers believed that:

1. US producers would have difficulty expanding to meet US demand.
2. Australian and Canadian production was essential to avoid shortages in the early 1980's.
3. Uranium prices would continue to rise as demand exceeded supply.
4. Enrichment capacity would become inadequate. It was thought necessary, therefore, to build enriched inventory in the early 1980's for use in the late 1980's. Artificially accelerated expansion of the uranium producer industry was necessary to accommodate anticipated enrichment demand.

Current perceptions are largely the opposite. These are the beliefs that were held most of this year and late last year as prices dropped:

1. US production is far in excess of domestic need. Contraction of the US production industry is necessary.
2. Canadian and Australian supply is optional and not essential. Producers in those countries are expanding mainly by displacing higher cost production and not because they fill a void.
3. Prices may be essentially stable for some time.
4. Enriched uranium is in excess supply.

1982 is shaping up to look like this:

1. Prices will have bottomed out. (That is not Nuexco's opinion necessarily, by the way, but it is my opinion.)
2. There will still be substantial utility inventories, but fewer spot sales.
3. Canadian and perhaps Australian sellers will have made substantial sales in the US and will be aggressively seeking more.
4. US production will have been dramatically curtailed. US utilities that wish to contract long term will have difficulty in finding domestic sellers. Concern will develop about the availability of US production capability. Virtually all long term contracts signed will be with non-US sellers.
5. An awareness will begin to develop among US buyers that we are approaching a period of dependence upon foreign uranium.

The history of the uranium market has been one of dramatic changes and overreaction to those changes. The rapid price rise of a few years ago generated excess US production capacity and the rapid price drop of the last two years will almost certainly result in too little capacity. It will soon be difficult for US buyers to buy domestic material except on the spot market. The question is, "will they care?"

The lack of demand, of course, is the underlying reason for the current poor health of the uranium industry. In 1972, 1973 and 1974 collectively, there were 105 nuclear reactors ordered in the US. That ordering rate was expected to continue and accelerate throughout this century. In 1975 through 1980 there were 56 more reactors cancelled than ordered. The net growth of our only customer since 1974 has been a negative 56. To put this in perspective, if these 56 reactors were operating now it would more than double present US uranium consumption.

Underlying lack of demand is something that is simply not going to change in this decade. Time is going to be required. New reactors, if ordered tomorrow, would not generate new uranium demand until after 1990. Even so, US annual consumption of uranium will rise from the 1980 level of 18 million pounds to about 40 million pounds by 1990. World annual consumption also about doubles in the period from 40 million pounds now to over 80 million pounds in 1990.

Ultimately there will not be another uranium boom without a substantial upturn in the fortunes of nuclear power generally. In today's dollars, we cannot expect to see $40 uranium again in this decade, and maybe ever.

A price recovery in the uranium market in this decade will not result from an inherent lack of uranium worldwide, but may result from lack of US production. I believe that there will be a price recovery to some degree because prices have now dropped below the point that sufficient production capacity will not be available in the US to support the minimum quantity of domestic purchases necessary to accommodate the "buy US" bias of US utilities. The minimum "buy US" bias is that quantity of uranium that the US industry will insist it buy from US sources, somewhat irrespective of price. There is a quantity that the US industry will buy of US origin, even if it has to pay a $5.00 or $10.00 per pound premium for it. This quantity, or percentage, varies greatly among US buyers, of course, but we have attempted to estimate the aggregate total.

The origin for this bias toward domestic supply comes from several sources. For example, as a US Government entity, Tennessee Valley Authority (TVA) is probably not going to buy 100 percent foreign uranium. I cannot imagine a set of circumstances that would preclude TVA from buying some portion from domestic sources, unless there was none available at any price.

Utilities with one reactor are more likely to insist upon a US source, because they are not in a position to diversify their supply and want the most reliable supply sources available to them. We know utilities that simply will not entertain the thought of buying non-US uranium. In addition, numerous long term contracts are already in place with US buyers and US sellers.

A rule of thumb that is oftentimes quoted is that US utilities are willing to buy about one-third of their uranium from foreign sources. If you take a survey, this is what they would probably tell you. The real question is, given a substantial price penalty, would they really buy any domestic?

We believe that toward the end of the decade, more than half of the US supply will come from non-US sources. Canada, Australia and Africa will be dominant, with Canada the favorite. If the utility industry does limit itself to one-third foreign purchases, the story would be quite different and prices would have to be higher. A one-third limit is not a reasonable expectation, however, because of the likely price differential between foreign and domestic material.

In order to quantify the aggregate "buy US" bias, we looked at the uncommitted requirements of each utility and guessed how much domestic material each would insist on buying. The guess was based upon our knowledge of each utility and their previous foreign buying practices. In each case, when in doubt, we tried to guess low. On the aggregate, we concluded that the US utility industry will buy a *minimum* of 15 million pounds more of domestic material from now through 1985, and 70 million pounds more from now through 1990 than they already have either in inventory or under contract. These conclusions were intended to be conservative. At present prices, the way the US production industry seems to be shaping up for this decade, that level of domestic buying cannot be supported without a price rise. We simply have to use material in the over-$25 per pound cost category to support the minimum "buy US" bias as it is currently assessed.

It is important to remember that this price firming will be somewhat artificial and it will take place in a rather depressed worldwide uranium market. US production will have cut back significantly from 1980 levels, barring an embargo. It would not be reasonable in such a market to expect any significant new conventional mine mill development in the US because of the high cost of new facility investment, long lead times involved, and the fragile nature of the market. The situation is made to order for the in-situ producer that can initiate production in a short time, with comparatively low capital expenditures, and is on the low end of the production cost spectrum.

If the scenario develops as I am suggesting it might, a two-tiered pricing structure would likely develop, with some US buyers willing to pay a premium for US material over non-US material.

One example of such a two-tiered market existed during the last 1960's and early 1970's with US

material being sold at about a dollar per pound premium over non-US material. This two-tiered market was due to the existence of the US embargo.

A second example is the premium that stringless uranium commanded a couple of years ago. This premium was paid for material the origins of which allowed reprocessing. Only buyers that wanted to reprocess were willing to pay the premium of about 50¢ to $1.00 per pound. This second example more closely parallels the situation I'm describing with premiums being paid only by certain US buyers for domestic supply. I would not expect two-tiered pricing to develop prior to mid-decade. The still existing overproduction capacity, together with the large domestic inventory in place, will preclude its happening.

All of us in contact with utilities have heard repeatedly the proposition that certain Public Utility Commissions will not authorize utilities to pay higher than "market price" for uranium. Perhaps some of them won't, but in a two-tier market it becomes increasingly difficult to define the term "market price." In any case, given the choice of paying a premium, however defined, for domestic material or buying 100 percent foreign origin material, many utilities will likely opt to pay a premium.

The idea of an import embargo is being encouraged by some people as a curb on the expected influx of foreign uranium. Although we do expect some Congressional consideration of an embargo, we don't expect an embargo. There are several reasons. The best one is that an embargo won't solve the problem. An embargo will not generate new demand. Even if there were a total embargo in effect now, we'd still have twice as much production in the US as we need and that situation has to change. Of course, it is changing and the transition is painful.

In conclusion, I'd like to say that the "buy US" bias of domestic utilities is real, and the US industry will not be entirely displaced by foreign sellers although by the end of the decade there will be a significant displacement. There are going to be some bright spots. I firmly believe that the in-situ producer in the US is in the best position to take advantage of the market opportunities that will present themselves over the next ten years.

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